

REMARKS

This Amendment, submitted in response to the Office Action dated July 22, 2004, is believed to be fully responsive to each point of rejection raised therein. Accordingly, favorable reconsideration on the merits is respectfully requested.

Claims 1-8, 59, 62 and 64-69 remain pending in the application and have been rejected under 35 U.S.C. § 103 as being unpatentable over Karellas (U.S.P. 5,864,146) in view of Perez-Mendez (U.S.P. 5,596,198) and further in view of Takahashi et al. (U.S.P. 5,059,794). Applicant submits the following arguments in traversal of the prior art rejections.

Karellas and Takahashi both relate to recording and reading of a stimuable phosphor storage element. Karellas suggests that scanning of a stimuable light is a poor alternative to flash exposure of a storage phosphor to stimulating light. See col. 36, lines 43-50. Karellas further suggests that using any form of scanning, due to its slower completion rate will increase dark current.

Takahashi teaches recording to a photoconductive layer and further discloses an electrode structure (Fig. 4) whereby a parallel arrangement of transparent electrodes 23-1 and 23-2 are disposed in parallel with each other and disposed perpendicular to a light emitting strip 25. During read out, a first channel of the light emitting member 25 is caused to emit light, and the charge inflowing into photoconductor layer 22 from each electrode 23 is equal to a charge

quantity from a small area (e.g. a pixel). Col. 7, lines 9-25. Also, it is significant to note in Takahashi that the avalanche effect is applied during the application of an x-ray field, such as during image recording and not at the time of read out, including stimulation by an excitation light. Col. 5, lines 52-61.

Perez-Mendez relates to a gamma ray detector using a scintillator that converts gamma rays to visible light. An exemplary sensor includes an unspecified gap separated pixel electrodes. The dimensions of the reading apparatus are not specific to picture element but can be variable depending on operating conditions.

The Examiner contends that the combination of Karellas, Takahashi and Perez-Mendez teaches each feature of claim 1. The Examiner concedes that Karellas does not teach spaced apart electrodes and an electric voltage applying means that provides an avalanche effect during impingement of the stimulating light. The Examiner cites Takahashi and Perez-Mendez to teach these features. Applicant submits that the rejection is not supported for at least four reasons.

First, though Karellas tangentially mentions a scanning stimulating light, Karellas effectively suggests that a scanning system, such as that claimed, provides poor performance due to dark current effects. Rather, Karellas emphasizes the benefits of a flash stimulating light exposure to mitigate dark current during read out. See col. 34, lines 41-51. In this regard, Karellas teaches away from the claimed invention and also away from the scan light arrangement

in Takahashi. Relatedly, the use of scanning and associated dark current undermines the Examiner's proffered motivation for combining references. In particular, the Examiner contends that optical detection sensitivity can be increased by combining features of Karellas and Takahashi. However, the cited combination would effectively increase dark current, and therefore detract from optical sensitivity rather than improve it.

Second, the Examiner appears to acknowledge that the mere fact that an output is described as pixelated does not further require the disposition of spaced apart electrodes to affect a read out. Specifically, the Examiner has characterized Karellas as providing pixels disposed in first and second directions but concedes that the reference lacks the spaced apart electrodes. The Examiner's reliance on Perez-Mendez to make up the deficiency is not supported. To the extent Perez-Mendez teaches a diode array, it is noted that the claim further describes that there is a one-to-one correspondence between electrode and picture element. Perez-Mendez offers no guarantee of a one-to-one correspondence since the charge elements of the read out circuit can be made correspondingly larger or smaller. Col.7, lines 24-28. Moreover, though the Examiner cites Perez-Mendez to show that arrays are known, the Examiner offers no motivation to replace the system of Karellas with the array of Perez-Mendez. Applicant submits further submit that Perez-Mendez activates according to a line-by-line scanning system and thus is susceptible to the dark current effects of a slow scan read out which Karellas seeks to avoid. Therefore, the combination is not warranted for this reason.

Third, the Examiner concedes that Karellas fails to teach an avalanche effect and cites Takahashi to correct this deficiency. However, as previously submitted, Takahashi discusses the avalanche in connection with exposure of a recording material to an x-ray source. By contrast, claim 1 describes application of the avalanche effect in relation to a stimulating light for read out purposes. The Examiner's reliance on the ambiguous description at col. 2 of Takahashi does not offset to clear teaching at col. 5, which describes avalanche occurring at a time other than that claimed by Applicant. Therefore, claim 1 is patentable for all the above reasons.

Fourth, Karellas related to image recording in a phosphor, while Takahashi describes recording to a photoconductive layer. The principles of detection in each reference differ fundamentally such that their combination is improper. The object of the present invention defined is to prevent the generation of dark current within a photoconductive layer during recording of a radiation image. On the other hand, in Takahashi, images are recorded onto a photoconductive layer while a voltage is applied to the photoconductive layer, which has nothing to do with the object of the present invention. Therefore, it would have been impossible to conceive of the invention recited in Claim 1 from the cited references.

With regard to the combination of Karellas and Perez-Mendez, Karellas, phosphorescence emitted by phosphors is detected with CCD's, and in Perez-Mendez, phosphorescence is detected with diode array. In contrast, in the present invention, images are

read out pixel by pixel with a detector comprising perpendicular linear electrodes, which is an entirely different type of detector from those used in the cited. Hence, it would not have been obvious from the teachings of the cited references to apply voltages to the detector in an attempt to obtain the avalanche amplification effect, since the type of detector is completely different between the present invention and the cited references.

Because claims 5 and 62 include features analogous to those set forth above for claim 1, claims 5 and 62 are also patentable for the reasons set forth above. The remaining claims are patentable based on their dependency.

With further regard to claim 3, this claim describes a photoconductive material thickness between 10 – 50 micrometers which is not taught by the 2-micrometer thickness cited by the Examiner. Claim 7 is patentable for similar reasons.

With further regard to claim 4, the Examiner concedes that Karellas fails to teach a voltage fluctuation suppression means but contends that it would be obvious to include such a feature based on equations and relations described by Takahashi. However, as the Examiner's own rejection indicates, a signal S and charge Q is a function of many variables. These variables include the application of certain x-ray energy and the light quantity L (photons per pixel), and efficiency of light incidence onto a photoconductive layer K. Therefore, there are many alternative characteristics that are more likely candidates for adjustment. Since the avalanche

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effect can be recognized reliably over a wide voltage range, there is no apparent reason that a voltage fluctuation suppression device is taught or suggested by the cited art. Therefore, claims 4 and 8 are patentable for this additional reason.

In view of the above, Applicant submits that claims 1-8, 59, 62 and 64-69 are in condition for allowance. Therefore it is respectfully requested that the subject application be passed to issue at the earliest possible time. The Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,


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